

**THE GENUS *TRIGONOSPERMUM* LESS.
(COMPOSITAE, HELIANTHEAE)**

by

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The genus *Trigonospermum* Less. was long thought to include but two Mexican species, *T. adenostemmoides* Less. (Syn. Gen. Comp. 214. 1832), and *T. melampodioides* DC. (in DC. Prodr. 5: 509. 1836). Several other Mexican species, however, have been proposed as new since 1890. In our opinion the genus consists of four recognizable taxa, two of which seem never to have been described.

The following synopsis is based on field observations particularly in western Mexico, and on herbarium specimens. We have studied jointly all the material in the herbarium of the Field Museum (F), the herbarium of Harvard University (A, GH), the University of Michigan Herbarium (MICH), the New York Botanical Garden (NY), and the United States National Herbarium (US). One of us (McVaugh) has studied selected specimens in the herbaria at Geneva (G, G-DC) and Paris (P). To the authorities at these institutions we express our appreciation for loans of material and for other courtesies. Publication of this paper was supported by the National Science Foundation (Grant GB-5218X, to McVaugh).

Trigonospermum Less. Syn. Gen. Comp. 214. 1832.

Annual or perennial suffrutescent herbs or nearly unbranched shrubs, pubescent, usually stipitate-glandular at least in the inflorescence; leaves opposite, rhombic-ovate to elliptic, dentate, setose with rigid basally swollen hairs, prominently triplinerved, the margins long-decurrent at base and forming a broad triangular extension of the base of the blade; inflorescence compound, subcorymbose, many-headed, not leafy; heads small, hermaphrodite, heterogamous, consisting of few—numerous functionally staminate disk flowers on a convex receptacle and 1–10 fertile (pistillate) ray flowers; involucre biseriate, the outer phyllaries linear to narrowly elliptic, commonly alternating with the carinate, obovate, acuminate, inner ones; inner phyllaries each clasping the two abaxial faces of an achene, and deciduous with it; pales scarious, of two kinds, the outer mostly obovate, 5–9-nerved, each appressed to an achene but not deciduous with it; inner series narrow, at most 1-nerved, each subtending the sterile stalk of a disk flower; rays yellow or white, deeply 3-lobed; disk flowers often darker than the rays, 5(–4)-lobed; pappus none; anthers usually as many as the corolla-lobes; achenes black, lustrous, ellipsoid to broadly obovoid or biconvex, obtusely 3-angled, 7–11-striate on each face.

In most general treatments of the Compositae, *Trigonospermum* has been placed near *Polymnia*, which it resembles in having sterile disk-flowers. Superficially the species of *Trigonospermum* are much like those of *Sigesbeckia*, which is usually allied with another series of genera because the disk-flowers are fertile. Probably the relationships should be re-assessed in the group that includes at least *Sigesbeckia*, *Rumfordia*, *Polymnia* and *Trigonospermum*, and perhaps other genera.

Key to the Species

1. Broad outer pales densely appressed-pubescent on one side near tip, appearing fimbriate-tipped; ray-flowers mostly 5–8.5 mm long, much exceeding the involucre; disk-flowers 19–41 (–55), densely pubescent on the outer surface of the lobes; achenes 1.9–2.7 mm long, truncate or the apex depressed, the terminal scar chiefly of two concentric rings; plant a subshrub up to 4 m high or more; mountains, mostly of the Pacific Slope, Guatemala to Durango. *T. melampodioides*.

1. Broad outer pales essentially glabrous, sometimes with a few stout hairs near tips, or sparingly ciliate; ray-flowers 4 mm long or less, rarely more than twice as long as the involucre; disk-flowers 8–10 (–13) or, if 17–22, glabrous or essentially so; achenes various, the style-base persistent as a rounded, oblique or amorphous protuberance; plants as far as known annuals 1 m high or less.
2. Narrow outer phyllaries strongly reflexed; disk flowers 17–22, not jointed at the base of the tube; outer pales scarcely larger than the inner, not inclosing the achenes, abaxially convex; styles of the disk-flowers bifid; ligule standing nearly at right-angles to the tube, with broad rounded basal rim surrounding the style; achenes dorsally compressed and biconvex, or the inner face angled; Pacific slope of western Guerrero. *T. blakei*.
2. Narrow outer phyllaries appressed to the involucre until the achenes fall; disk-flowers 8–10 (–13), jointed at the base of the tube, the filiform stipes persistent after the flowers fall; outer pales obovate, much wider than the linear or filiform inner ones, abaxially concave, inclosing the achenes but not falling with them; styles of the disk-flowers undivided; ligule narrowed to the base, its long axis continuing that of the tube; achenes trigonous or ellipsoid.
3. Broad outer pales eciliate, but somewhat erose at tips, 1.8–2.5 (–3) mm long; broader phyllaries 2.5–3.5 mm long; achenes (including the persistent style-base) 1.8–2.4 mm long, broadest near the apex; region of Orizaba and Jalapa, Veracruz. *T. adenostemmoides*.
3. Broad outer pales sparingly slender-ciliate at the erose tips, 2.5–4 (–5) mm long; broader phyllaries 3.5–5.5 mm long; achenes (including style-base) 3–4 mm long, broadest at or slightly above the middle; central Mexico, mostly at elevations of 1900–2500 m, from near Mexico City to San Luis Potosí and Sonora. *T. annuum*.

1. ***Trigonospermum adenostemmoides*** Less. Syn. Gen. Comp. 214. 1832.

Probably an annual, up to 80 cm high or more, unbranched except in the inflorescence; rigid inflated hairs abundant on the leaves; sessile foliar resiniferous glands none; inflorescence branches bearing few inflated flaccid hairs and many multicellular gland-tipped hairs; leaves 6–10 cm long, 4–6 cm wide; margins shallowly and rather uniformly serrulate (except on the basal angles and the decurrent base) with 20–30 low callose teeth on each side; heads in flower about 3 mm long, in fruit 3.5–4 mm long; outer phyllaries 1–1.5 mm long; inner phyllaries 2.5–3.5 mm long, 2.5 mm wide, apiculate, glabrous except for a few inflated hairs on the backs; outer pales (1.8–) 2.5 (–3) mm long, 1.3–1.5 mm wide, nearly white, 5- to 7-nerved, glabrous, erose at the rounded apex; inner pales filiform, 1 mm long or less, a little shorter than the stalks of the disk flowers; ray flowers 3 (?), about 2 mm long; disk flowers 8–10; achenes 1.8–2.4 mm long, 1.1–1.3 mm wide, turbinate, 3-angled, broadest near the apex, truncate with rounded elevated style base 0.1–0.3 mm high; basal scar callose, unilateral.

Known only from the type-region, in the foothills of central Veracruz at low elevations, between Orizaba and Jalapa.

VERACRUZ: Tocuila al N. de Orizaba, 19 Nov 1967, *Rosas R. 780* (GH, MICH); near Orizaba, May 1856, *Schaffner 325* (P); Orizaba, Nov 1854, *Botteri 1189* (G, MICH, P); Río Blanco, région d'Orizaba, 24 Jul 1866, *Bourgeau 2691* (P); San Cristóbal, Orizaba, *C. Mohr 255* (US); Xalapa, *Galeotti 4079* (P); without locality, *Schiede 215* (P); without locality, *ex herb. Sch. Bip.* (P).

Because this plant is poorly represented, even in most of the larger herbaria, the correct application of the epithet *adenostemmoides* has been unknown to most botanists. The plant described below as *Trigonospermum annuum* has mostly passed under the name of *adenostemmoides*. The latter is not precisely identifiable from the original description, which is very generalized. No definite type-locality is given; Lessing says merely that the plant is Mexican in origin, and that it was sent to him by Schiede. The plant is described as annual, and the heads are said to be "minutis." Schlechtendal (*Linnaea* 9: 267. 1834) described, under the name of *T. adenostemmoides*, a Schiede specimen presumably collected near Jalapa, stating that this was one of a series listed on the basis of determinations made by Lessing ["E schedis a Lessingio relictis"]. Presumably it was this reference by Schlechtendal that led

DeCandolle (in DC. Prodr. 5: 508. 1836) to cite *T. adenostemmoides* as from near Jalapa. We have not seen any specimen identifiable as Lessing's type, nor the Schiede specimen described by Schlechtendal (which conceivably could be the type, as Schiede's collections were handled and distributed chiefly by Schlechtendal). It may be noted, however, that there is a Schiede specimen at Paris, which confirms the assumption that he did collect this particular species; we have not seen any other specimens of *Trigonospermum* collected by Schiede, and the probability seems to be that the plant described by Lessing is the one we are calling *adenostemmoides*. No other species of the genus is known to occur in the same region. Many of Schiede's early collections in Mexico were from the lowlands of Veracruz, so it seems likely that

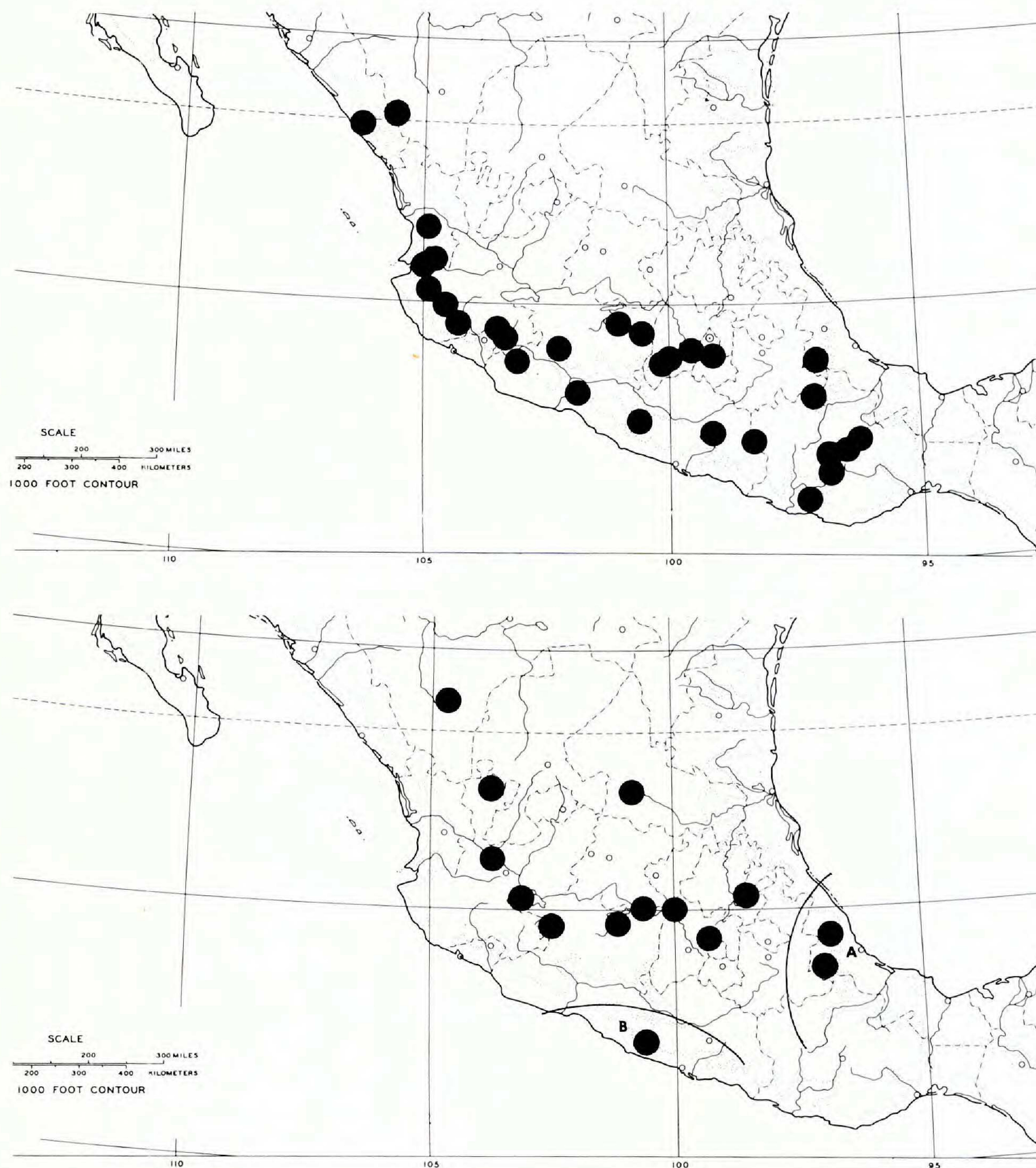


FIG. 60 (above). Distribution of *Trigonospermum melampodioides* in Mexico (one Guatemalan locality not shown).

FIG. 61 (below). Distribution of *Trigonospermum annuum* (one locality in Sonora not shown), *T. adenostemmoides* (A), and *T. blakei* (B).

if he collected the type of *T. adenostemmoides*, it represented this same small-flowered species that grows around Orizaba and Jalapa.

2. ***Trigonospermum annuum*** McVaugh & Laskowski, sp. nov.

Annuum, 0.3–1 m altum, puberulum, ramulis glandulosis; folia caulinea, elliptica vel ovata, acuminata, basi obtusa vel cuneata, supra scabra vel hispidula, subtus pallidiora et strigosiuscula, marginibus serrulatis vel subintegris, petiolis usque ad 2.5 cm longis, basi connatis; rami florescentes ascendentes longi, e foliorum caulium axillis oriundi, capitulis pauciusculis, cymosis, tenuipedunculatis, 2.25–5 mm longis; phyllaria exteriora angusta (4–) 5, appressa, 0.5–1 mm lata, interiora 3.5–5.5 mm longa, 3–4 mm lata, apiculata; paleae exteriores 2.5–4 (–5) mm longae, apice ciliatae, obovatae, quam interiores multo latiores, abaxiale concavae et achaenia plusminusve involventes sed cum eis non caducae; paleae interiores filiformes linearesve; flores radii saepe 3, subrecti, 1.5–3 (–4) mm longi, ligulis flavis obtuse trilobatis, basi angustatis non deflexis; flores disci 8–10 (–13), basi geniculati, stipitati, stipitibus post anthesin persistentibus, stylis indivisis; achaenia subtrigona, 3–4 mm longa, elliptica usque ad obovoidea, apice rotundata vel truncata.

Annual herbs 0.3–1 m tall, with taproot 1.5–7 cm long, the stem unbranched except as part of the inflorescence; stem sometimes purple-tinged, up to 5 mm thick at base, unevenly shallowly sulcate, puberulent except at the very base, the inflorescence branches bearing few inflated flaccid hairs, and numerous multicellular gland-tipped hairs 0.2–0.4 mm long; nodes 5–8 below the inflorescence, the upper ones leaf-bearing at flowering time, the largest leaves at or above the middle; principal leaves (3–) 5–10 (–15) cm long and (1.3–) 2–6.5 (–9) cm wide; blades elliptic to ovate, acuminate, scabrous to hispidulous above with inflated hairs, paler below and rather sparsely strigose especially along the veins, usually dotted with sessile resinous glands, obtuse or cuneate at base, the margins decurrent on the petiole for 0.5–2 cm below the juncture of the lateral veins; margins shallowly and uniformly serrulate (except on the basal angles and the decurrent base) with 5–21 (–32) teeth on each side, or the teeth few and shallow and the margins appearing subentire; unmarginated petioles up to 2.5 (–3.5) cm long, sometimes marginally pilose, connate at base; heads relatively few, on slender and usually drooping peduncles, in cymes at the tips of long ascending branches arising from the axils of almost all the foliage leaves, the terminal branches sometimes subtended by much reduced leaves but not forming a conspicuous terminal inflorescence; heads 2.25–5 mm long in flower, longer in fruit; outer phyllaries (4–) 5, mostly 2.5–3.5 mm long and 0.5–1 mm wide, puberulent and often glandular; inner phyllaries (in fruit) 3.5–5.5 mm long, 3–4 mm wide, apiculate, strigose and usually glandular; outer pales 2.5–4 (–5) mm long, 2–2.5 mm wide, nearly white, scarious, 5- to 9-nerved, erose and very sparsely ciliate at the rounded apex; inner pales scarious, filiform to linear, 1.25–2.3 mm long, usually a little longer than the stalks of the disk flowers; ray flowers commonly 3, 1.5–3 (–4) mm long and 3–4.5 mm wide, with obtuse lobes 1.5–2.25 mm long, resinous-dotted, the tube 0.4–1 mm long; style-branches 0.6–1 mm long; disk flowers (1–) 8–10 (–13), 1.5–2 mm long, funnellform, resinous-dotted and with few scattered hairs; lobes 4–5, 0.2–0.35 mm long, acute; anthers 4–5, 0.5–0.7 mm long, appendaged 0.15–0.23 mm, not exerted; achenes as many as the ray flowers or fewer, 3–4 mm long, 1.65–2.2 mm wide, broadly elliptic or obovate in outline, broadest at or slightly above the middle, rarely near the rounded or sometimes truncate apex, tipped by the convex style-base 0.2 mm high.

Moist places among fields and hills, along creeks and in humid ravines, 1200–2500 m in elevation, mostly on the Central Plateau of Mexico from the State of México and Michoacán to San Luis Potosí and Sonora. Fruiting and flowering



FIG. 62. Habit and floral details of *Trigonospermum*. *Trigonospermum annuum* (McVaugh 23841), habit, about half natural size, drawn by Karin Douthit. Above, right, head enlarged, with facing ray-flower removed; achene and outer pale, X10. *T. melampodioides*, below, right, head enlarged, with facing ray-flower removed; achene and outer pale, X10. Heads and floral details drawn by Laskowski, from Pringle 4568 (*T. annuum*), McVaugh 14058 (*T. melampodioides*) and Bourgeau 809 (same, the pale).

specimens have been collected in September and October, some weeks earlier than the usual fruiting period of *T. melampodioides*.

MEXICO: DISTRITO FEDERAL: Pr[ès] Tacuba, Sep [18]55, *Schaffner 248* (GH, P).

DURANGO: Beside a creek, Nov 1896, *E. Palmer 852* (GH, US).

GUANAJUATO: Near Acámbaro, 6 Oct 1892, *Pringle 5307* (GH).

HIDALGO: Regla, *C. Ehrenberg 448* (P).

JALISCO: SE of Mezquitic, 14 Sep 1966, *Anderson & Laskowski 3628* (MICH); barranca of Tequila, 4 Oct 1893, *Pringle 4568* (F, GH, MICH, type; NY, P, US); NE of San Juan Cozalá, 11 Sep 1967, *McVaugh 23841* (MICH).

MEXICO: Montagne près de Guadalupe, Vallé de Mexico, 24 Aug 1865, *Bourgeau 809* (G, GH, MICH, P); Tultenango Station, 9 Oct 1902, *Pringle 9938* (F, GH).

MICHOACAN: NE of Cotija de la Paz, 1 Dec 1970, *McVaugh 24910* (MICH); Cerro de las Nalgas, vicinity of Morelia, 1900 m, 9 Sep 1909, *Bro. G. Arsène s.n.* (US); Rincón, près Morelia, 19 Sep 1909, *Arsène 2547* (P); Punguato, vicinity of Morelia, 2200 m, 5 Sep 1912, *Arsène s.n.* (US).

SAN LUIS POTOSI: Chiefly in the region of San Luis Potosí, 22°N. Lat., 6000–8000 ft., 1878, *Parry & Palmer 432* (GH, NY, US); Cultivated from seed, Davenport, Iowa, United States, 1879, *Parry & Palmer 432* (F).

SONORA: Rincanarda [sic] Mts., 27 Nov 1890, *C. E. Lloyd 418* (GH, NY, US).

3. *Trigonospermum blakei* McVaugh & Laskowski, sp. nov.

Annum, ut videtur 50 cm altum, pro genere sparsim pilosum, caulibus dichotomis, inflorescentiis diffusis paucicapitatis; folia ovata, 6–7 cm longa, sensim acuminata, basi attenuata, marginibus serrulatis; capitula 8–10 mm lata, phyllariis exterioribus linearibus 5, valde reflexis, interioribus obovatis, acuminatis, basi saccatis; paleae 2–2.5 mm longae, acutae, exteriores eciliatae, quam interiores vix majores, cucullatae, abaxiale convexae, achaenia non involventes; flores radii 5, ligulis albis subpersistentibus trilobatis abrupte deflexis; flores disci 17–22, stylis bifidis; achaenia compressa, ambitu obcordata, biconvexa vel superficie interiore obtuse angulata, apice styli base rotunda coronata.

Probably annual, said to be 50 cm high, very sparingly pubescent for the genus, the leaves nearly glabrous, with a few flaccid broad-based hairs especially on the veins, and a row of similar hairs on the line joining the leaf-bases; stem nearly glabrous except in the smallest branches of the inflorescence and the filiform peduncles, the latter with numerous short gland-tipped hairs and a few flaccid inflated hairs; stems 4 or 5 times dichotomous above the middle, the diffuse inflorescence 25–30 cm high and wide, with few heads on very slender but scarcely nodding peduncles 10–15 mm long, and the main branches subtended by foliage leaves successively reduced in size above; principal leaves 6–7 cm long, 3–3.5 cm wide, ovate, gradually acuminate, resinous-dotted beneath, rounded abruptly toward the attenuate petiolar base, the margins decurrent nearly the whole length of the petiole, then abruptly narrowed and rounded off at the very base; margins finely and distantly serrulate with about 15 teeth on each side, the proximal half of the blade nearly or quite entire; heads in flower 8–10 mm wide; outer phyllaries usually 5, linear, ciliate, 0.8–1.3 mm long, strongly reflexed and appressed to the peduncle; inner phyllaries obovate, acuminate, 2.5–3 mm long, 1.5–1.8 mm wide, hispidulous on the outer surface near tips, saccate at base; pales 2–2.5 mm long, acute, 1-nerved, entire, acute, at least the outer ones with a few bristles near tip but not ciliate; outer pales narrowly obovate, cucullate, 1.5 mm wide near tips, the inner ones half as wide, linear, nearly equalling the flowers; ray flowers 5; ligules white, subpersistent on the achenes, glabrous, 4 mm long with 3 oblong obtuse ascending lobes 1.5–2 mm long, standing at right angles to the tube, with broad rounded basal rim; tube less than 0.5 mm long, densely and softly pale-hirsute; style-branches about 0.5 mm long; disk flowers 17–22, about 2 mm long, the campanulate throat about as long as the slender tube, the lobes about 0.5 mm long, deltoid, roughened within; styles bifid; anthers about 0.5 mm long, included; achenes obcordate in outline, biconvex or the inner face with an obtuse central angle,

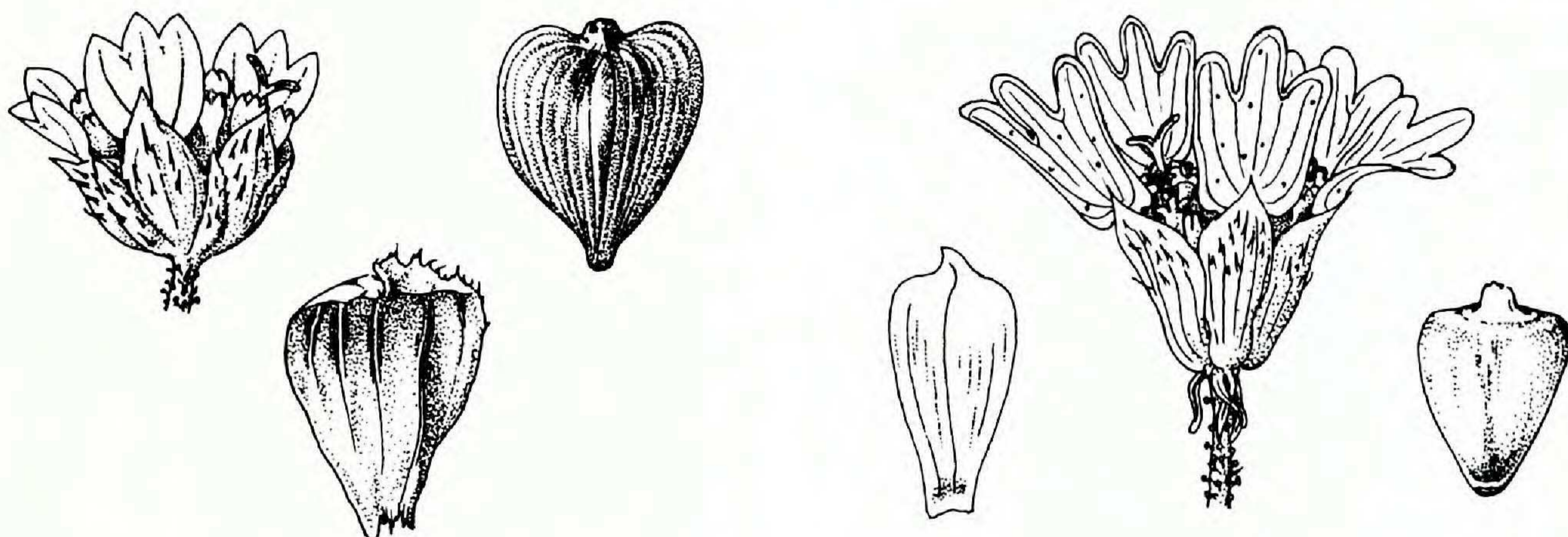


FIG. 63. *Trigonospermum*. *T. adenostemmoides* (at left): Flowering head, enlarged (M. Rosas R. 780); achene (Schiede 215) and outer pale (Rosas 780), X10. *T. blakei* (at right; Hinton 14706, type): flowering head, enlarged; achene and outer pale, X10. Drawings by Laskowski.

1.5 mm long, 1.2 mm wide, 0.7 mm thick, broadest at the truncate apex, and there tipped by the prominent rounded pale style base 0.2–0.3 mm high.

“Mixed forest,” at an elevation of 850 m, Dist. Galeana, Guerrero, Mexico; known only from the type-collection.

MEXICO: GUERRERO: Dist. Galeana, Carrizo to Santo Domingo, elev. 850 m, 24 Nov 1939, Hinton 14706 (MICH, type; GH, NY, US).

This extraordinary plant was recognized as a new species of *Trigonospermum*, but never described as such, by the late S. F. Blake. It differs in so many respects from all the known species of *Trigonospermum* that it would be unthinkable to relate it to any of them. It is possible that it represents some other genus—perhaps even an undescribed genus—but in aspect, in kinds and distribution of glandular and non-glandular pubescence, in leaf-form, venation and serration, and in the morphology of the involucre, as well as in the more technical characters of fertile ray-flowers, sterile disk-flowers, and achenes falling with the loosely inclosing inner phyllaries, it is typically a *Trigonospermum*. It differs from the other known species of that genus in the ways noted in the key above, none of which by itself seems very important, but which taken together make this, to say the least, an unusual *Trigonospermum*.

4. *Trigonospermum melampodioides* DC. in DC. Prodr. 5: 509. 1836. *Eriocephalus trinervatus* Sessé & Moc. Pl. Nov. Hisp. 150. 1890. *Trigonospermum tomentosum* Rob. & Greenm. Proc. Am. Acad. 32: 44. 1896. *Trigonospermum floribundum* Greenm. Proc. Am. Acad. 39: 99. 1903. *Trigonospermum hispidulum* Blake, Jour. Wash. Acad. Sci. 19: 272. 1929.

Perennial suffrutescent herbs or few-branched shrubs 0.6–4 m tall, the stems up to 5 cm thick at base, finely sulcate at least in the upper branches, glabrate below, sparsely to copiously hispid in the inflorescence with broad-based flaccid hairs, and there also beset with yellow to dark brown or purple glands which vary from nearly sessile to long-stalked, the stalks up to 0.8 mm long; principal blades (6–) 8–12 (–24) cm long and (2.5–) 5–7 (–13.5) cm wide, broadly ovate to rhombic-ovate, sometimes broadly elliptic, roughened above with many rigid broad-based hairs, sparsely to copiously hirtellous, sericeous or tomentose beneath, often minutely resinous-dotted, acuminate at tip, at base from acute to obtuse or almost truncate, the margins cuneately decurrent for a distance of 0.5–2.5 (–5) cm below the juncture of the lateral veins; margins uniformly or irregularly serrulate or denticulate with 15–35 (–60) teeth on each side, these mostly on the distal margins but also occurring sparingly on the proximal margins and the decurrent base; blades sometimes very unevenly dentate or denticulate, or with small lobes especially near the widest part, the

leaves then subhastate; unwinged part of the petiole almost none or 0.5–1.5 cm long, commonly sparsely pilose along the margins; inflorescence consisting mostly of a terminal corymbiform cyme, many-headed, the ascending flowering branches mostly from the axils of the uppermost 1–2 pairs of leaves; peduncles scurfy-puberulent or hispid with short inflated hairs mixed with sessile to stipitate glands (these variable in abundance but more densely concentrated here than in the lower inflorescence-branches); heads at anthesis 2.5–6 mm long; outer phyllaries 5 (–8), linear, (1.2–) 2.5–3.5 (–4.1) mm long, almost glabrous to hirtellous, ciliate, often gland-dotted; inner phyllaries (4–) 5 (–10), 2.5–3.5 mm long, obovate, more or less keeled, more pubescent than the inner ones, the apex fimbriate-ciliate and cuspidate-acuminate; outer pales obovate, 1.8–3 mm long, scarious or sometimes purple-tinged, mostly 9- to 11-nerved, fimbriate at the truncate or rounded apex and appressed-pubescent adaxially near the tip; inner pales filiform to subulate, 1.25–2 mm long, 1-nerved, fimbriate especially at apex; ray-flowers (4–) 5 (–10), mostly 5–8.5 mm long, the ligule 4.5–9.5 mm wide, gland-dotted on the abaxial surface, 8- to 11-veined, with rounded lobes 2–3.5 mm long and tube 0.5 mm long or less; style-branches 1–1.6 mm long; disk flowers 19–41 (–55), 1.5–2.8 mm long, campanulate above a tubular base 0.5–0.75 mm long; lobes (4–) 5, 0.3–0.6 mm long, deltoid or narrower, acute; anthers (4–) 5, 0.75–1.3 mm long, often exerted over half their length; achenes as many as the rays (or by abortion fewer), (1.5–) 2–2.7 (–3.3) mm long and about two-thirds as wide, turbinate and bluntly 3-angled, broadest near the apex and there truncate or concave; circular scar left by the corolla base pale, prominent, surrounding the circular remains of the style-base, the terminal scar as a whole depressed or rarely slightly elevated.

Forests of pine, pine-oak, fir, or mixed coniferous and broad-leaved trees, often in *barrancas* or on steep well-drained slopes, sometimes in wetter places along streams, mostly 1700–2800 meters, occasionally at lower elevations, flowering from May to January or throughout the year. Guatemala; Oaxaca to the State of Mexico, Jalisco, Sinaloa and Durango.

This species is variable with respect to pubescence (especially of the lower, or abaxial, leaf-surface), toothing and lobing of leaf-margins, and number of achenes and inner phyllaries. None of these characters, however, seems to be correlated with others in such a way as to suggest that more than one species is involved in the complex. The types of *Eriocephalus trinervatus*, *T. tomentosum*, and of *T. melampodioides* itself, are relatively heavily pubescent; similar plants occur occasionally throughout the range of *T. melampodioides* (sens. lat.), without geographical segregation as far as we can tell.

The type of *T. hispidulum* is characterized by having somewhat irregularly toothed leaves which are subhastate, with small acute toothlike lobes near the widest part of the blade; the pubescence is relatively scant, a little harsher than in plants like the type of *T. tomentosum*, and the ligules are smaller than the average in *T. melampodioides*. A few other plants from western Jalisco (e.g. *McVaugh 13739, 14088*) are similar to the type, but at least some larger-flowered plants with non-hastate leaves are known from the same region, and unless further investigation there indicates the existence of a distinct allopatric population of the *hispidulum* type, it is best to treat the latter as merely an extreme of the polymorphic *T. melampodioides*.

The most common number of ray flowers is five. Specimens bearing more than five ray flowers and achenes per head are occasional in all parts of the range. Proliferation of ray flowers and achenes occurs in isotypes of *T. tomentosum* as well as in isotypes of *T. hispidulum*. The supposedly distinctive features of *T. floribundum* are the larger size of the involucre and rays and the increased number of rays (5–8). The isotypes of this species are distinguished by bearing the greatest numbers of disk flowers of any specimens studied and the prevalence of heads with 8 rays and achenes. Otherwise they range well within the cluster for each character tested.

GUATEMALA: SACATEPEQUEZ: Volcán de Agua, S of Santa María de Jesús, 1800–2100 m, 10 Dec 1938, *P. C. Standley 59378* (MICH).

MEXICO: DURANGO: Crest of Sierra Madre Occidental, 2.9 mi E of El Palmito, 2.1 mi E of Sinaloa-Durango state line on México 40, 6700 ft, 31 Jan 1962, *D. E. Breedlove 1744* (MICH).

GUERRERO: Mpio. de Chichihualco, 9 km W of Camotla, elev. 2400 m, 1 Dec 1963, *J. Rzedowski 18019* (MICH); Cerro Tlacatepec, near the sawmill village of Agua Fría, Mpio. de Tlacatepec, ca 40 km N of Coyuca de Benítez, 2650 m, 4 Dec 1963, *C. Feddema 2903* (MICH); approx. same locality, same date, 2500 m, *Rzedowski 18133* (MICH); 16 km E of Agua Fría, elev. 2400 m, 30 Jan 1965, *Rzedowski & McVaugh 273* (MICH); Distr. Montes de Oca, San Antonio, 10 Jun 1937, *G. B. Hinton 10301* (MICH, NY); Distr. Mina, Puerto Rico, 1725 m, 20 Apr 1939, *Hinton 14189* (F, GH, NY, US); Distr. Mina, Chilacayote-Mangito, 1750 m, 30 Nov 1939, *Hinton 14934* (GH, NY, US); Distr. Mina, Petlacala, Barranca del Ranchito, elev. 1905 m, 5 Jan 1938, *Ynes Mexia 9087* (F, GH, NY, US); Sierra Madre [upper Río Tecpan], 1700 m, 26 Jan 1899, *E. Langlassé 795* (GH, MICH, US); W of Omiltemi, 7800 [ft], 9 Jun 1953, *McCorcle & Rowell 3442* (MICH); [Ayahualtempa?], *Sessé, Mociño, et al. 3932* (MA, lectotype of *Eriocephalus trinervatus*).

JALISCO: Nevado de Colima, along a lumber road which ascends from a point about 11 miles from Atenquique on the Tonila road, 2200 m, 3 Apr 1951, *R. McVaugh 11763* (MICH, US); Nevado de Colima, W of the northern ridge, 2100–2200 m, 16 Oct 1952, *McVaugh 13549* (MICH, US); ca 29 road miles W of Ayutla, mixed forest with fir, elev. ca 1950 m, 3 Nov 1962, *Cronquist 9795* (MICH, NY); Sierra de la Campana, road to Mascota, 7–8 mi NW of Los Volcanes, 1900–2000 m, 23–25 Oct 1952, *McVaugh 13739* (MICH, US); 20–22 km S of Talpa de Allende, elev. 1200–1450 m, 28–30 Mar 1965, *McVaugh 23332* (MICH); near Santa Mónica (probable lat. ca. 20° N., long. ca. 104°30'W.), 1950–2050 m, 12–13 Nov 1952, *McVaugh 14058* (MICH); 12–15 mi SSE of Autlán, 4–10 mi above (SE of) Ahuacapán, 1500–2200 m, 22–23 Nov 1959, *McVaugh & Koelz 981* (MICH); 21–24 km S of El Chante [ca 25 km SE of Autlán], elev. 1650–1850 m, 19 Mar 1965, *McVaugh 23072* (MICH); Sierra del Halo, near a lumber road leaving the Colima highway 7 mi SSW of Tecalitlán, 2000–2200 m, 28–29 Nov 1959, *McVaugh & Koelz 1125* (MICH); San Sebastián, E of Arroyo del Cura, 5 Jan 1927, *Mexia 1395* (GH, US); San Sebastián, Arroyo Seco, 1500 m, 19 Jan 1927, *Mexia 1527* (F, US); W of San Sebastián, Hacienda del Ototal, Arroyo del Ototal, 1500 m, 9 Mar 1927, *Mexia 1852* (A, F, GH, MICH, US, Isotypes of *T. hispidulum*).

MEXICO: Distr. Temascaltepec, Rincón, 1960 m, 19 Nov 1932, *Hinton 2432* (F, GH, NY, US); Distr. Temascaltepec, Tejupilco, 1340 m, 26 Dec 1932, *Hinton 3023* (GH, NY, US); Distr. Sultepec, Almoloya, 28 Mar 1935, *Hinton 7460* (MICH, NY, US); Real de Abajo, Sultepec, 1700 m, 21 Sep 1953, *Matuda 29185* (NY); Distr. Temascaltepec, Cumbre de Tejupilco, 1700 m, 6 Mar 1935, *Hinton 7489* (MICH, NY).

MICHOACAN: Temaxcal, 18 May 1939, *Frye & Frye 2608* (GH, NY, US); Distr. Zitácuaro, Zitácuaro-Jurungo, 3 Jun 1938, *Hinton 11915* (MICH, NY); Distr. Coalcomán, Coalcomán, elev. 1000 m, 27 Jan 1939, *Hinton 12908* (GH, NY, US); NW of Aguililla, 6–7 km S of Aserradero Dos Aguas, elev. 2000 m, 3 Mar 1965, *McVaugh 22719* (MICH); Morelia, Cerro Azul, 2200 m, *Bro. Arsène 6756* (US); Distr. Zitácuaro, Zitácuaro-Aputzio, 2100 m, 27 Dec 1938, *Hinton 13534* (MICH, NY); Distr. Uruapan, Tancítaro, 2075 m, 11 Oct 1940, *Hinton 15498* (GH, US); between the Río del Salto and La Polvilla, ca. 18 mi E of Morelia, 2160–2400 m, 9–18 Nov 1961, *King & Soderstrom 5030* (MICH, NY); 2 mi S of Tancítaro, 1950 m, 14 Aug 1940, *W. C. Leavenworth 549* (F, GH, NY); Cerro Tancítaro, 2700 m, 19 Aug 1940, *Leavenworth 695* (F).

MORELOS: Sierra de Tepoxtlán, 7500 ft., 27 Nov 1902, *C. G. Pringle 8686* (F, GH, MICH, P, US) [paratypes of *T. floribundum*]; Sierra de Tepoxtlán, near Cuernavaca, 7500 ft., 4 Nov 1900, *Pringle 9179* (GH,¹ lectotype of *T. floribundum*; MICH, US, isolectotypes); Tepoztlán, elev. 1800 m, 30 Dec 1951, *E. Matuda 25898* (NY).

NAYARIT: 9.5 mi W of Tepic, elev. 1000–1100 m, 25 Sep 1960, *McVaugh 19381* (MICH).

OAXACA: Without locality, *Andrieux 243* (P), *Franco* in 1842 (P); cordillera, 4000 ft, Jun 1840, *Galeotti 2130* (P); near Soledad, 6 Feb 1945, *E. J. Alexander 554* (MICH); Sta. Inés del Monte, Zimatlán, 2800 m, 8–9 Dec 1905, *C. Conzatti 1335* (GH); Distr. de Teotitlán, Alturas San Bernardino, 2300 m, 10 Dec 1907, *Conzatti 2088* (F, GH); 10 mi S of Sola de Vega, elev. 2100 m, 8 May 1965, *D. E. Breedlove 9874* (MICH); Distr. del Centro, Acueducto de Xochimilco, 1570 m, 16 Mar 1937, *Conzatti 5257* (MICH, NY, US); on the way to Ixtlán de Juárez, 8–10 mi from Oaxaca, 31 Jan 1960, *King 2495* (MICH); in monte San Felipe, *Andrieux 320* (G, type; P, isotype of *T. melampodioides*); west slope of Mt. Zempoaltepec, 7700–8000 ft, 5–13 Jul 1894, *E. W.*

¹The lectotype, at GH, and the sheet at US, have the number written in ink by Pringle as 9178, but corrected to 9179; the MICH sheet bears a printed label with the number 9179. Pringle's no. 9178 was a species of *Gnaphalium*.

Nelson 617 (GH, US, paratypes of *T. tomentosum*); from Panixtlahuaca to Juquila, 1000 ft, 26 Feb 1895, *Nelson 2393* (GH, lectotype of *T. tomentosum*; US, isolectotype); Barranca de San Luis, Cerro San Felipe, 1750 m, 27 May 1906, *Pringle & Conzatti 1438* (GH).

SINALOA: Mazatlán [ex Standley], Jan 1923, *J. G. Ortega 5093* (US).

STATE UNKNOWN: [SINALOA or DURANGO, probably between Mazatlán and Durango], N. W. Mexico, *Seemann* (GH), *Seemann 1893* (P); [possibly GUERRERO], *Sessé, Mociño, et al. 3980, 3990* (F, MA).